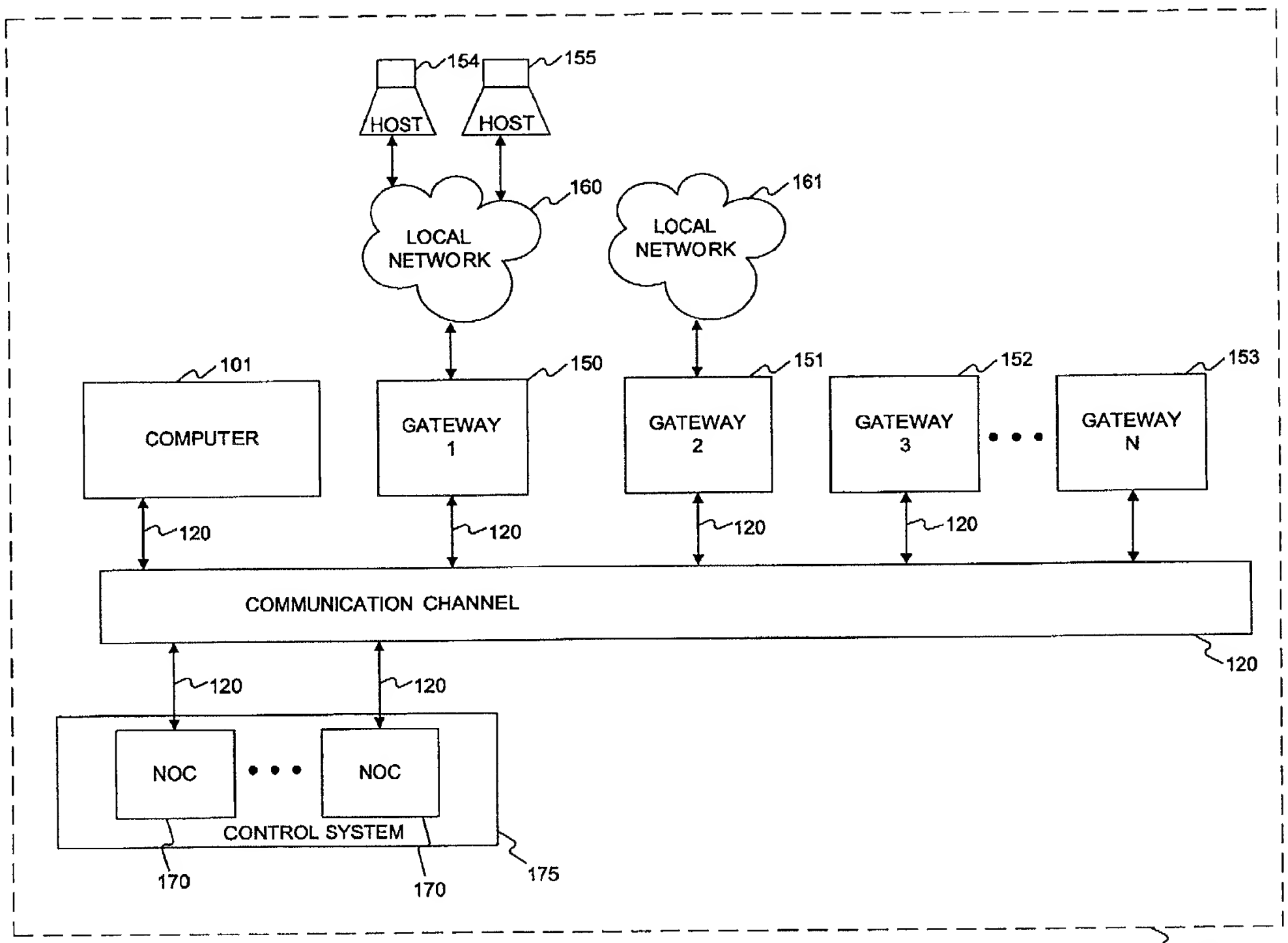
154
155
HOST
HOST
160
161
LOCAL NETWORK
LOCAL NETWORK
101
150
151
152
153
COMPUTER
GATEWAY 1
GATEWAY 2
GATEWAY 3
GATEWAY N
120
120
120
120
120
COMMUNICATION CHANNEL
120
120
120
NOC
NOC
CONTROL SYSTEM
170
170
175
100

FIG. 1

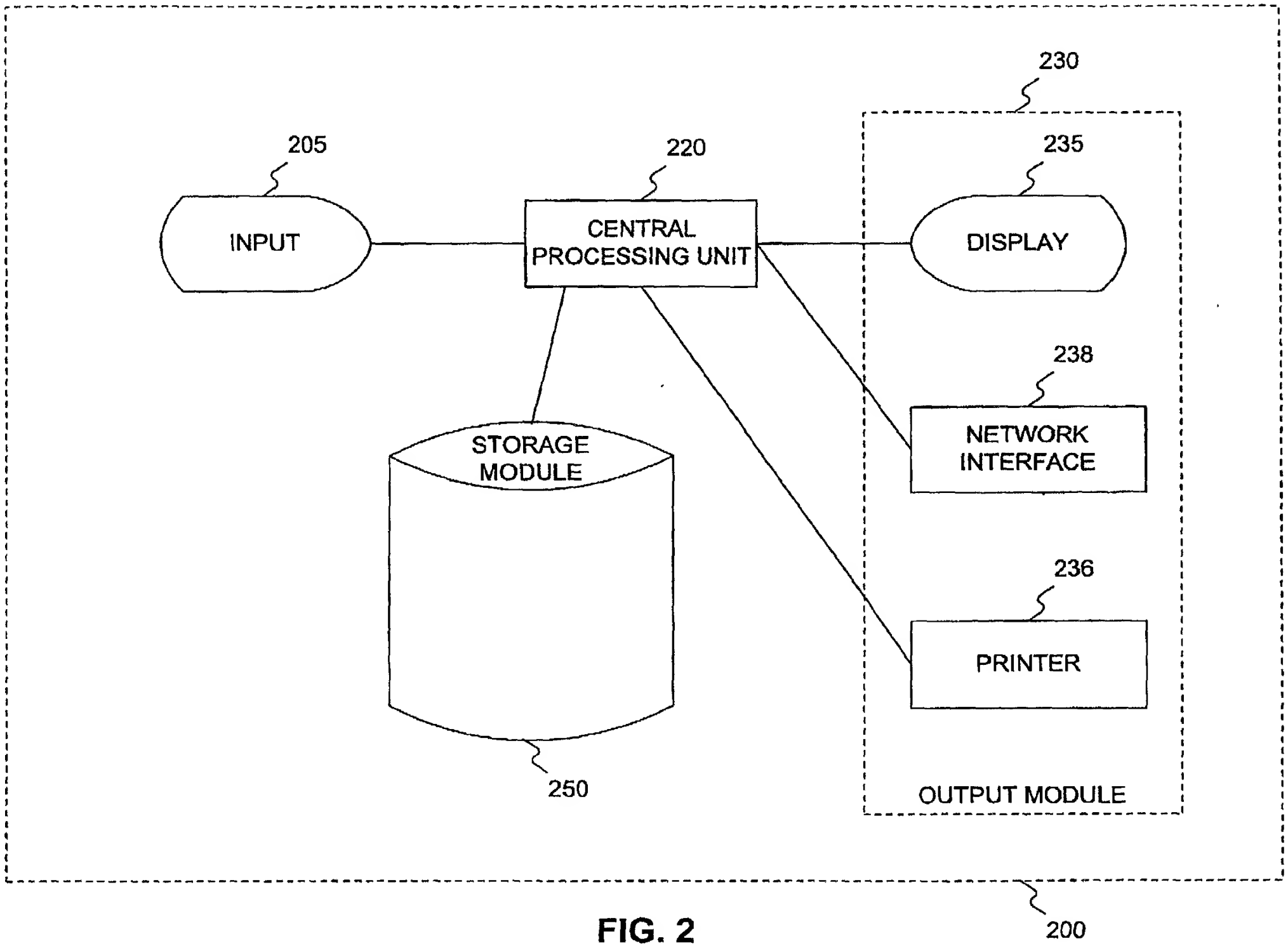
230
205
220
235
INPUT
CENTRAL PROCESSING UNIT
DISPLAY
238
NETWORK INTERFACE
STORAGE MODULE
236
PRINTER
250
OUTPUT MODULE
200

FIG. 2

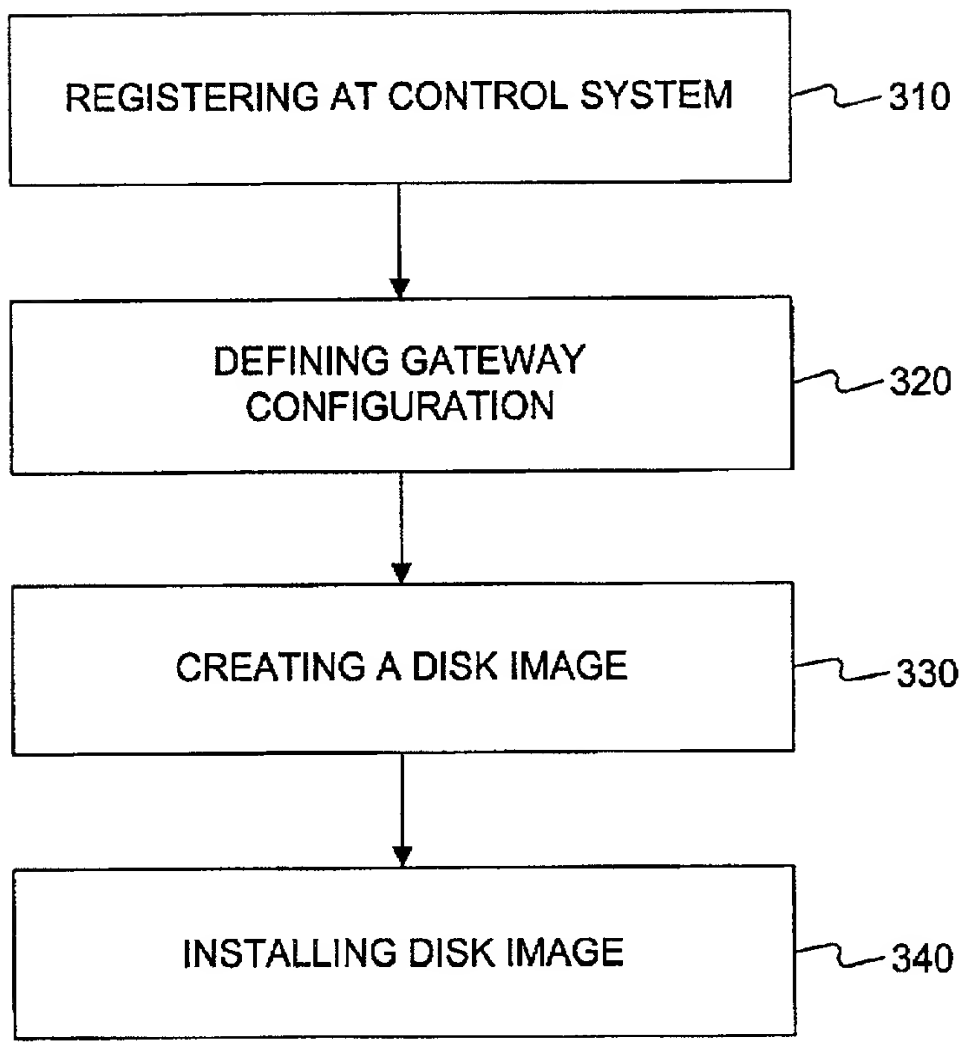
REGISTERING AT CONTROL SYSTEM
310
DEFINING GATEWAY CONFIGURATION
320
CREATING A DISK IMAGE
330
INSTALLING DISK IMAGE
340

FIG. 3

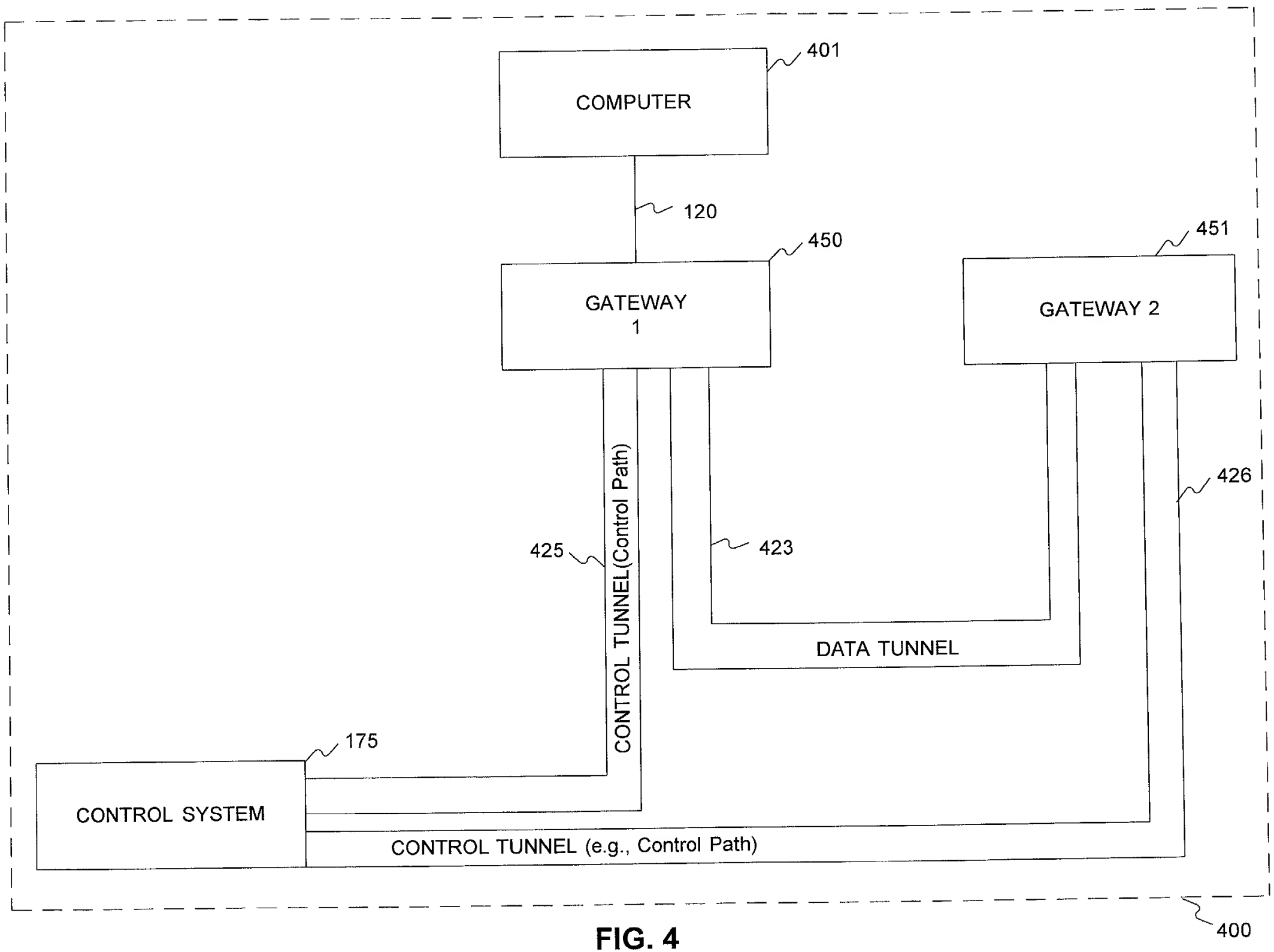
COMPUTER
401
120
GATEWAY 1
450
GATEWAY 2
451
425
CONTROL TUNNEL(Control Path)
423
DATA TUNNEL
426
175
CONTROL SYSTEM
CONTROL TUNNEL (e.g., Control Path)
400

FIG. 4

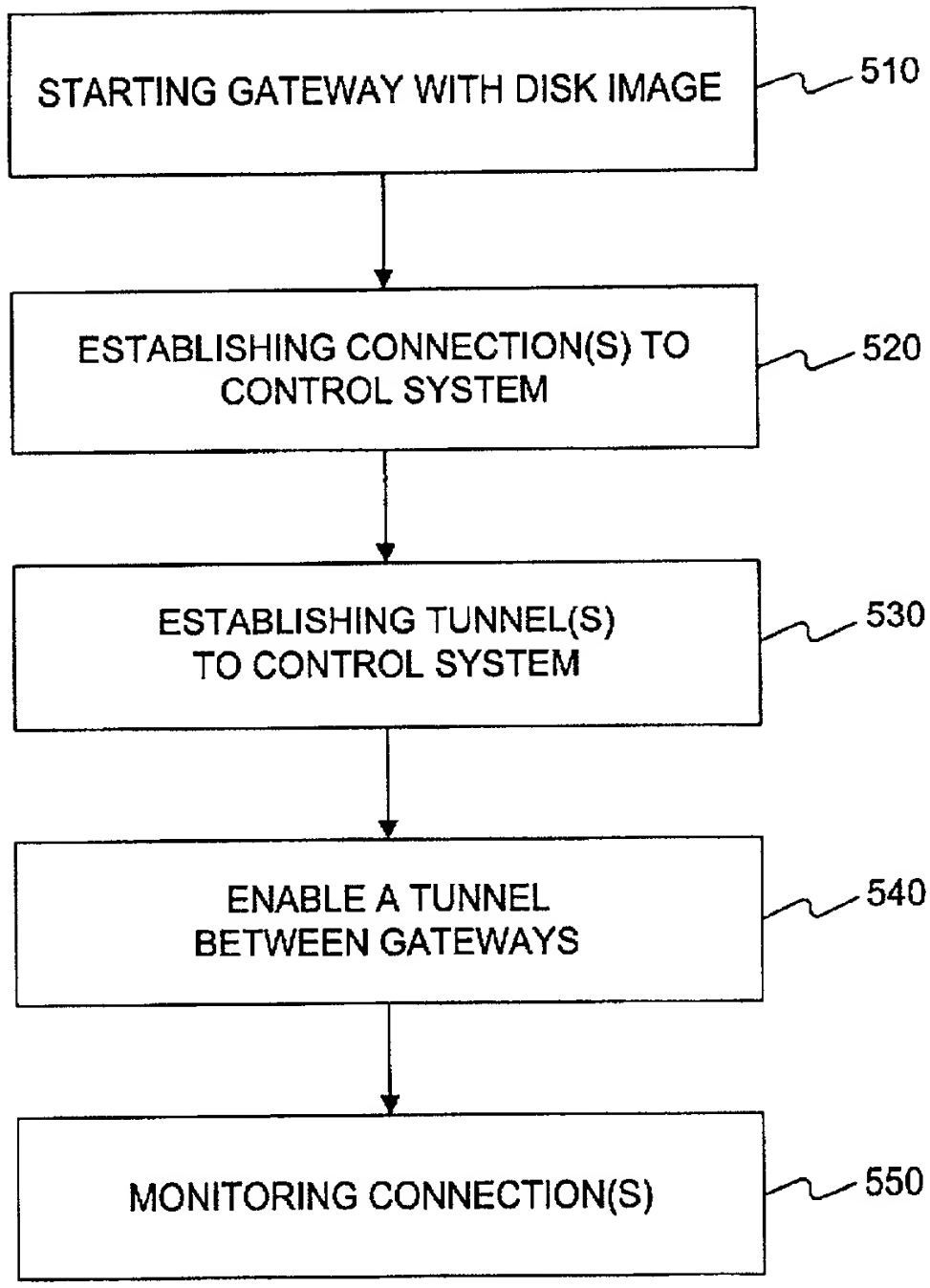
STARTING GATEWAY WITH DISK IMAGE
510
ESTABLISHING CONNECTION(S) TO CONTROL SYSTEM
520
ESTABLISHING TUNNEL(S) TO CONTROL SYSTEM
530
ENABLE A TUNNEL BETWEEN GATEWAYS
540
MONITORING CONNECTION(S)
550

FIG. 5

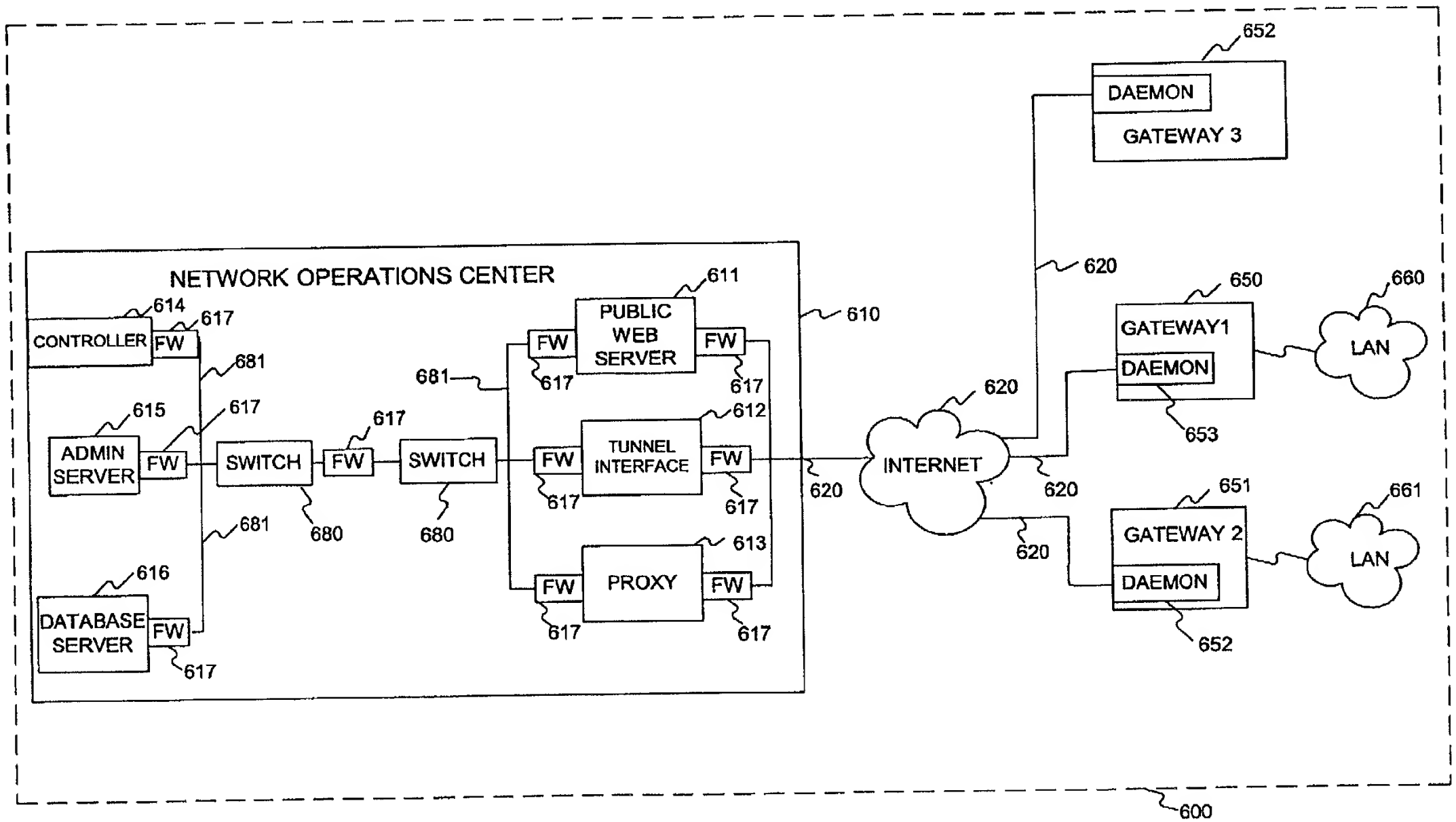
NETWORK OPERATIONS CENTER
610
CONTROLLER
FW
614
617
681
615
ADMIN SERVER
FW
617
SWITCH
FW
617
SWITCH
680
680
681
616
DATABASE SERVER
FW
617
PUBLIC WEB SERVER
FW
FW
611
617
617
681
612
TUNNEL INTERFACE
FW
FW
617
617
613
PROXY
FW
FW
617
617
620
INTERNET
620
620
620
652
DAEMON
GATEWAY 3
650
GATEWAY1
DAEMON
653
660
LAN
651
GATEWAY 2
DAEMON
652
661
LAN
600

FIG. 6A

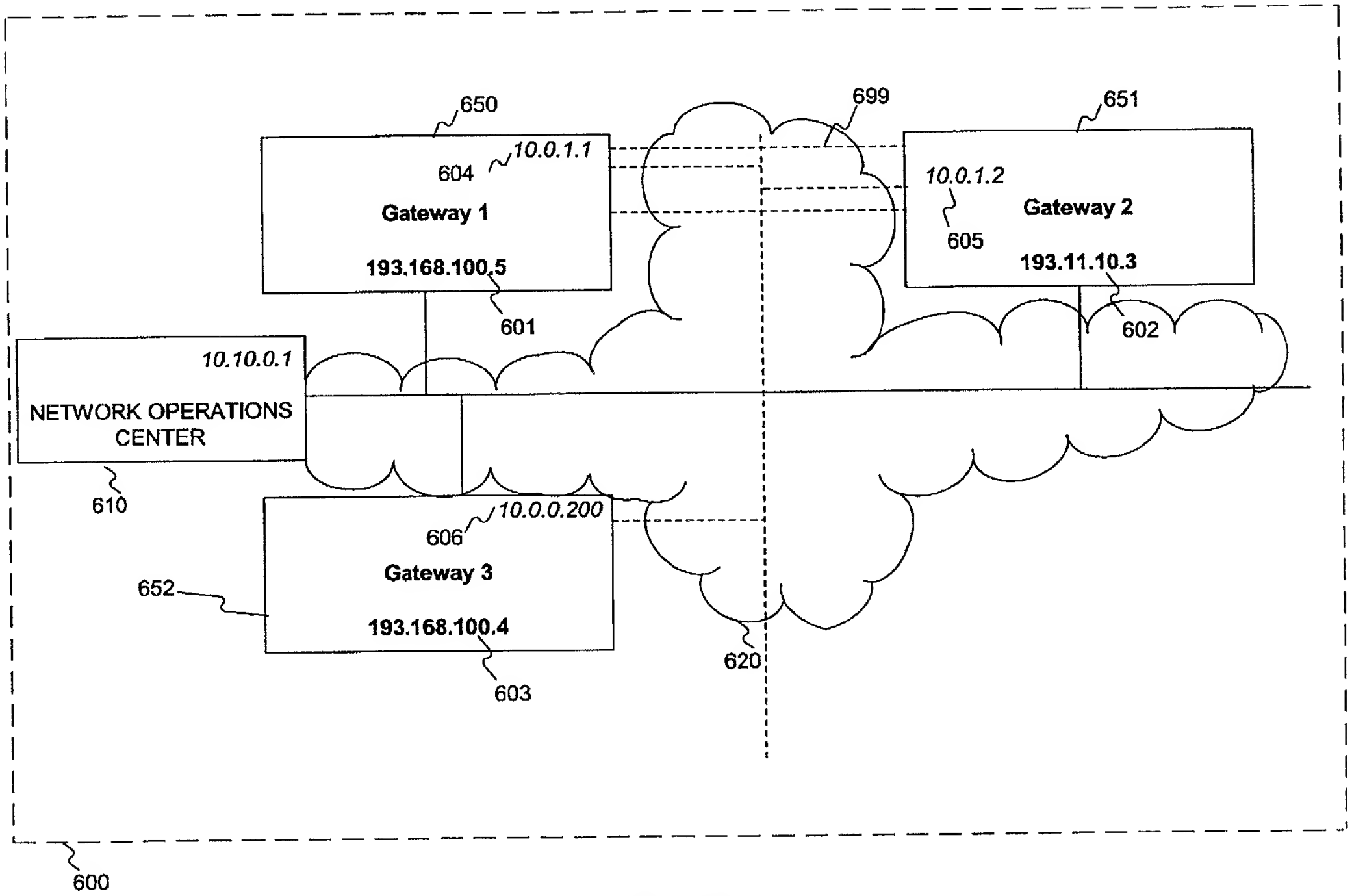
650
699
651
10.0.1.1
604
Gateway 1
193.168.100.5
601
10.0.1.2
605
Gateway 2
193.11.10.3
602
10.10.0.1
NETWORK OPERATIONS CENTER
610
10.0.0.200
606
Gateway 3
652
193.168.100.4
603
620
600

FIG. 6B

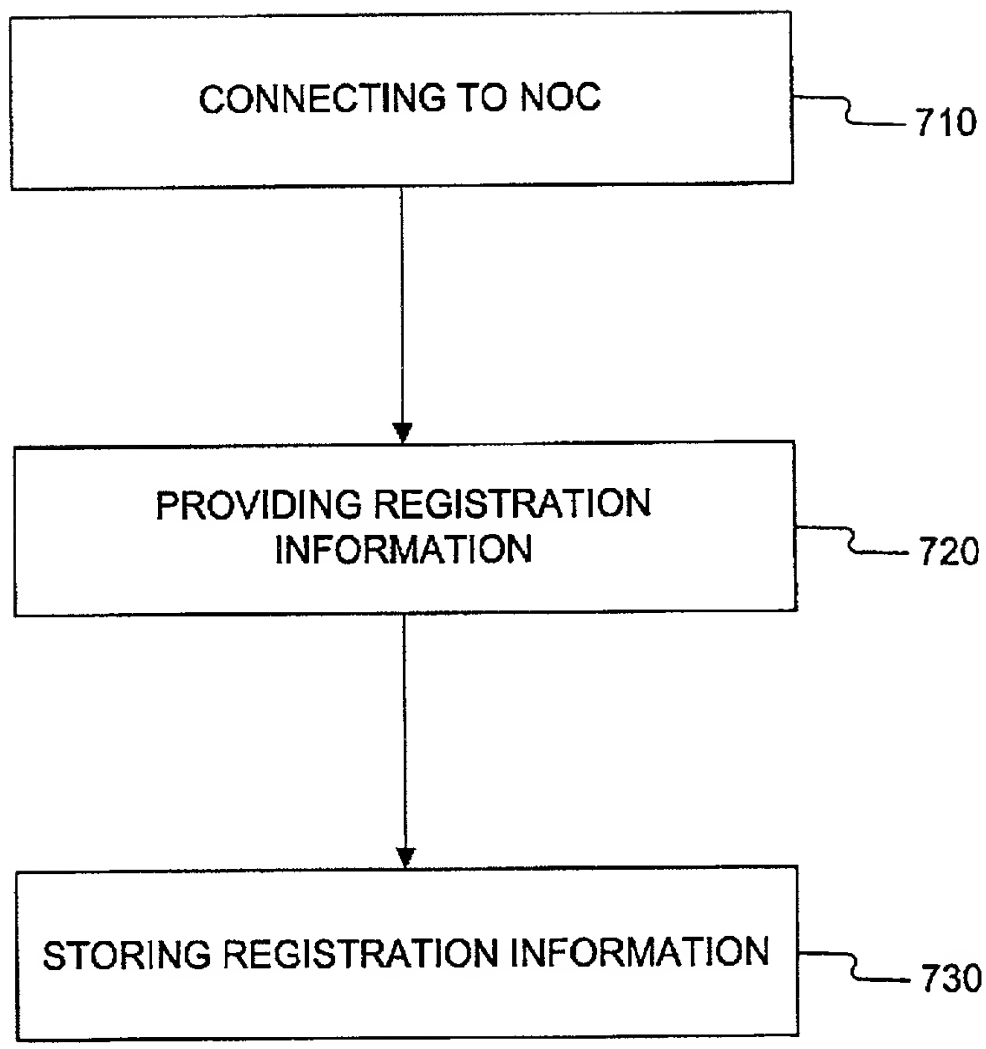
CONNECTING TO NOC
710
PROVIDING REGISTRATION INFORMATION
720
STORING REGISTRATION INFORMATION
730

FIG. 7

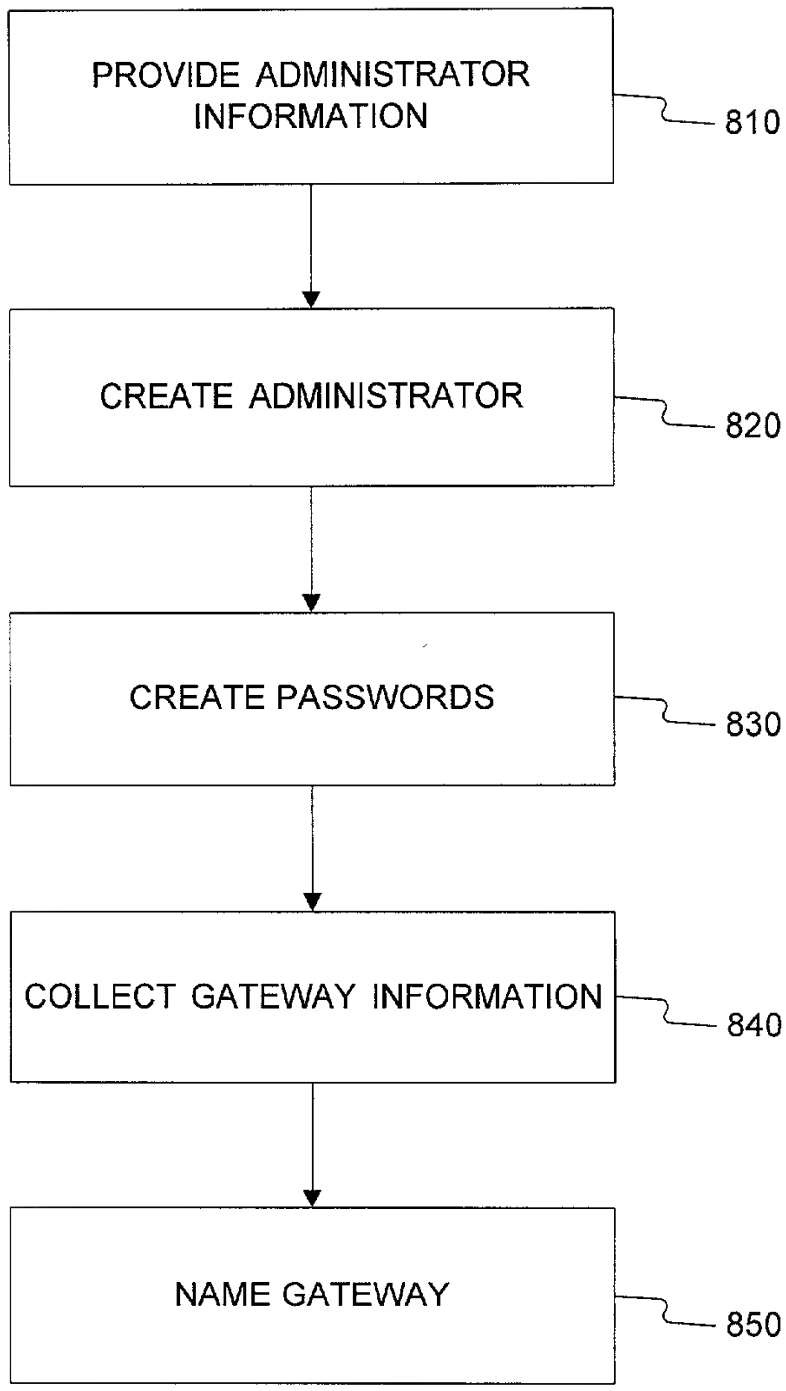
PROVIDE ADMINISTRATOR INFORMATION
810
CREATE ADMINISTRATOR
820
CREATE PASSWORDS
830
COLLECT GATEWAY INFORMATION
840
NAME GATEWAY
850

FIG. 8

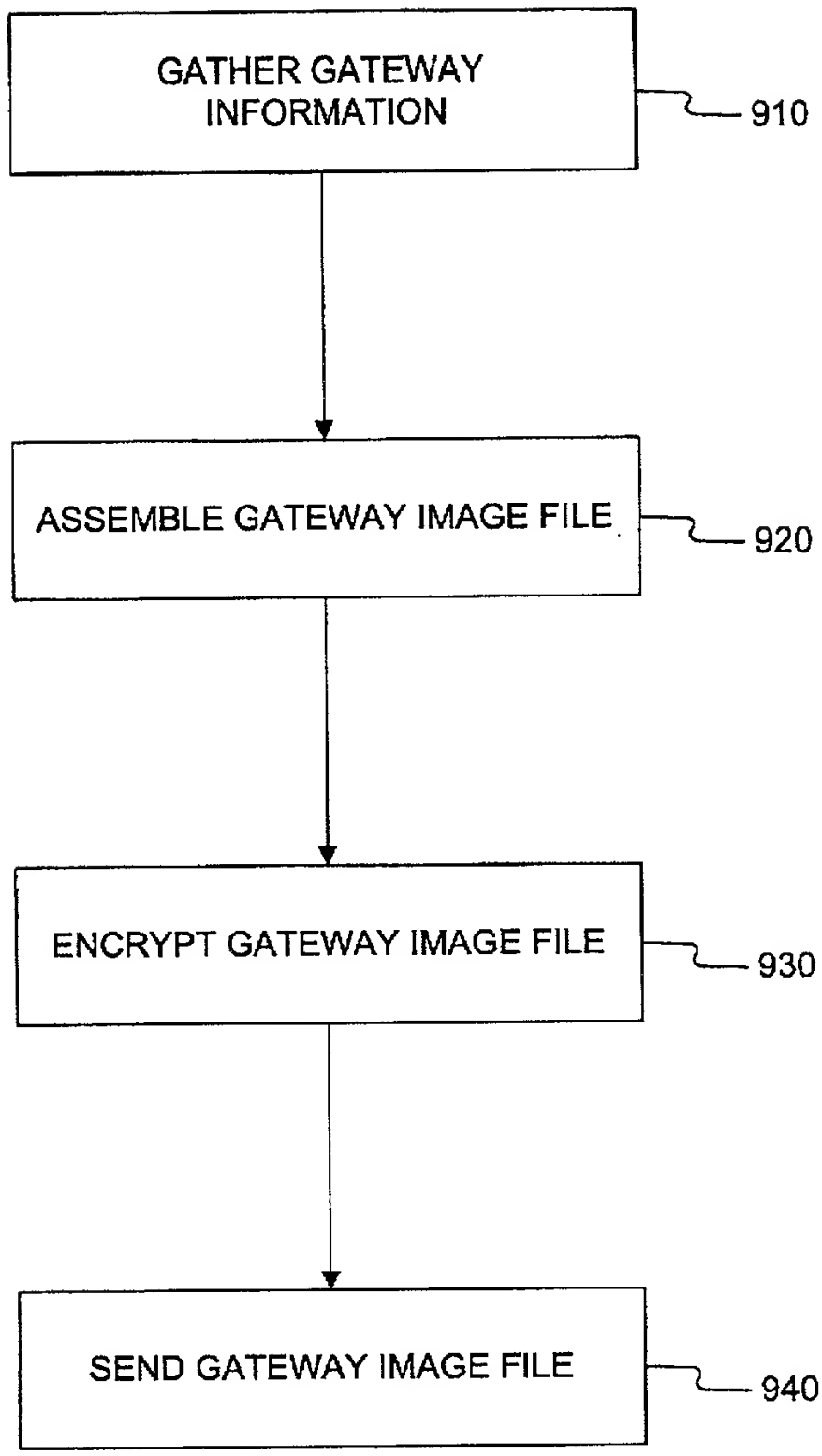
GATHER GATEWAY INFORMATION
910
ASSEMBLE GATEWAY IMAGE FILE
920
ENCRYPT GATEWAY IMAGE FILE
930
SEND GATEWAY IMAGE FILE
940

FIG. 9

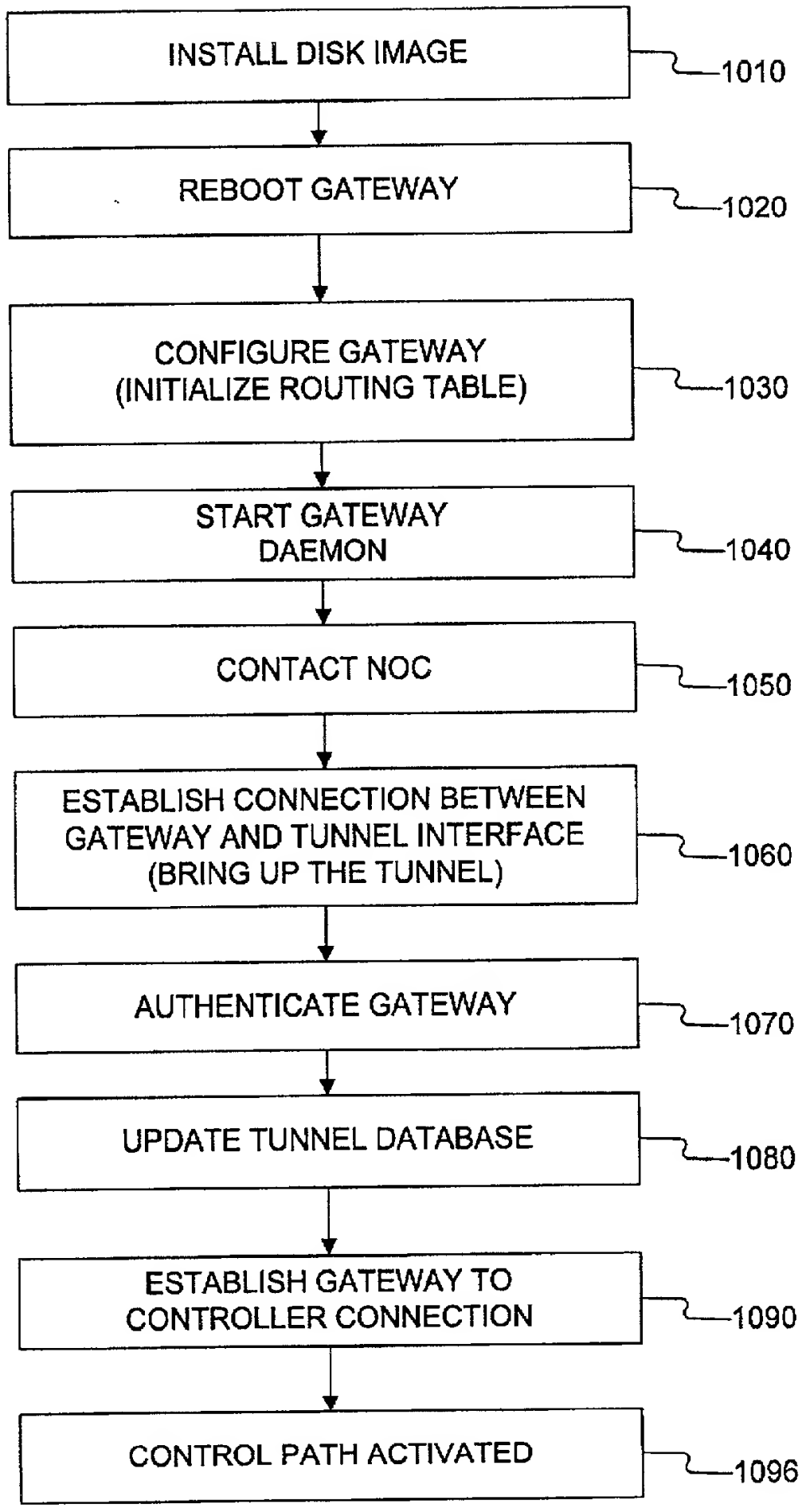
INSTALL DISK IMAGE
1010
REBOOT GATEWAY
1020
CONFIGURE GATEWAY
(INITIALIZE ROUTING TABLE)
1030
START GATEWAY
DAEMON
1040
CONTACT NOC
1050
ESTABLISH CONNECTION BETWEEN
GATEWAY AND TUNNEL INTERFACE
(BRING UP THE TUNNEL)
1060
AUTHENTICATE GATEWAY
1070
UPDATE TUNNEL DATABASE
1080
ESTABLISH GATEWAY TO
CONTROLLER CONNECTION
1090
CONTROL PATH ACTIVATED
1096

FIG. 10

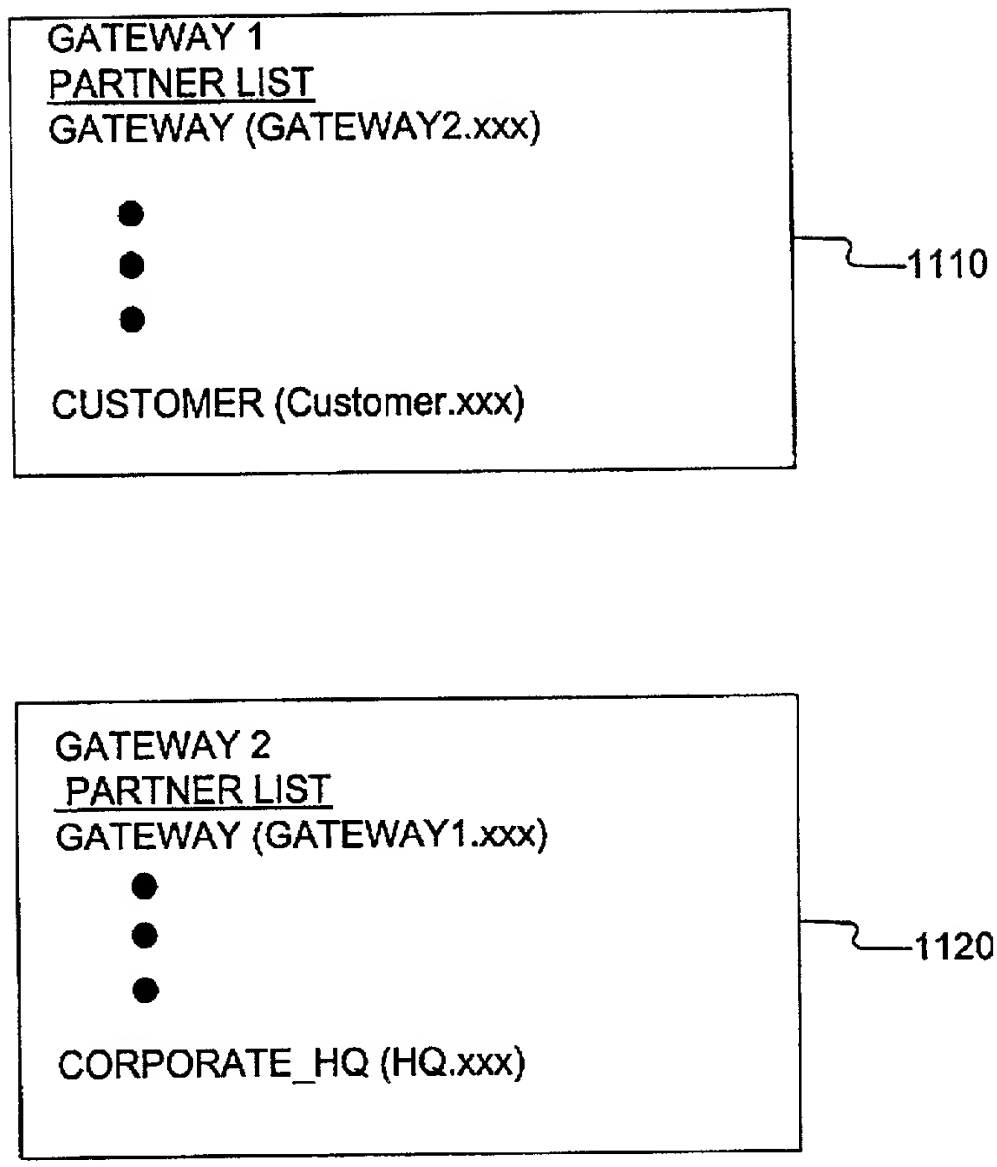
GATEWAY 1
PARTNER LIST
GATEWAY (GATEWAY2.xxx)
CUSTOMER (Customer.xxx)
1110
GATEWAY 2
PARTNER LIST
GATEWAY (GATEWAY1.xxx)
CORPORATE_HQ (HQ.xxx)
1120

FIG. 11

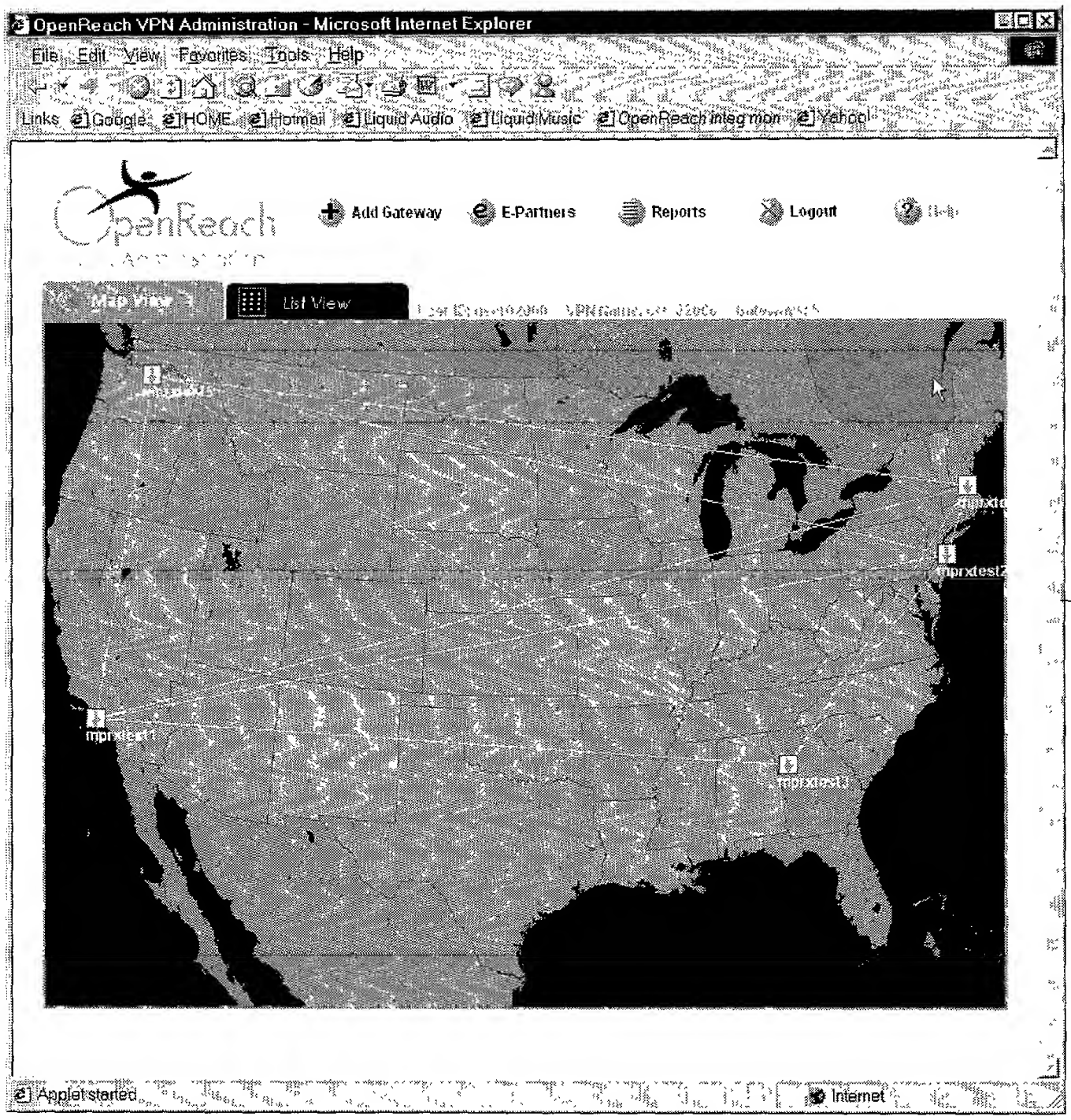
OpenReach VPN Administration - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Links Google HOME Hotmail Liquid Audio Liquid Music OpenReach integ mon Yahoo!
OpenReach
Add Gateway
E-Partners
Reports
Logout
Map View
List View
mprxtest1
mprxtest3
Applet started
Internet
1250

FIG. 12

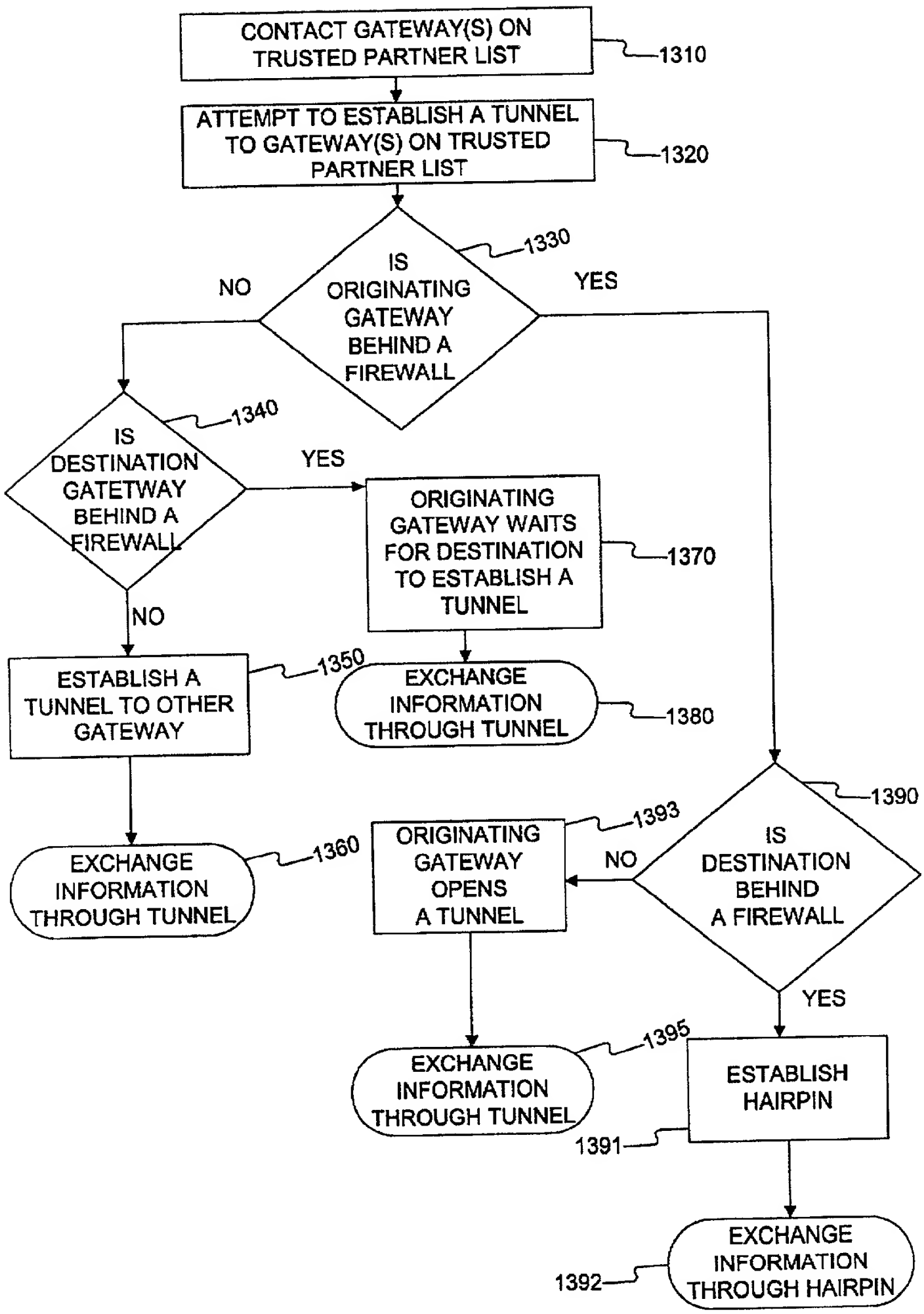
CONTACT GATEWAY(S) ON TRUSTED PARTNER LIST
1310
ATTEMPT TO ESTABLISH A TUNNEL TO GATEWAY(S) ON TRUSTED PARTNER LIST
1320
IS ORIGINATING GATEWAY BEHIND A FIREWALL
1330
NO
YES
IS DESTINATION GATETWAY BEHIND A FIREWALL
1340
YES
NO
ORIGINATING GATEWAY WAITS FOR DESTINATION TO ESTABLISH A TUNNEL
1370
ESTABLISH A TUNNEL TO OTHER GATEWAY
1350
EXCHANGE INFORMATION THROUGH TUNNEL
1380
IS DESTINATION BEHIND A FIREWALL
1390
NO
ORIGINATING GATEWAY OPENS A TUNNEL
1393
EXCHANGE INFORMATION THROUGH TUNNEL
1360
YES
EXCHANGE INFORMATION THROUGH TUNNEL
1395
ESTABLISH HAIRPIN
1391
EXCHANGE INFORMATION THROUGH HAIRPIN
1392

FIG. 13

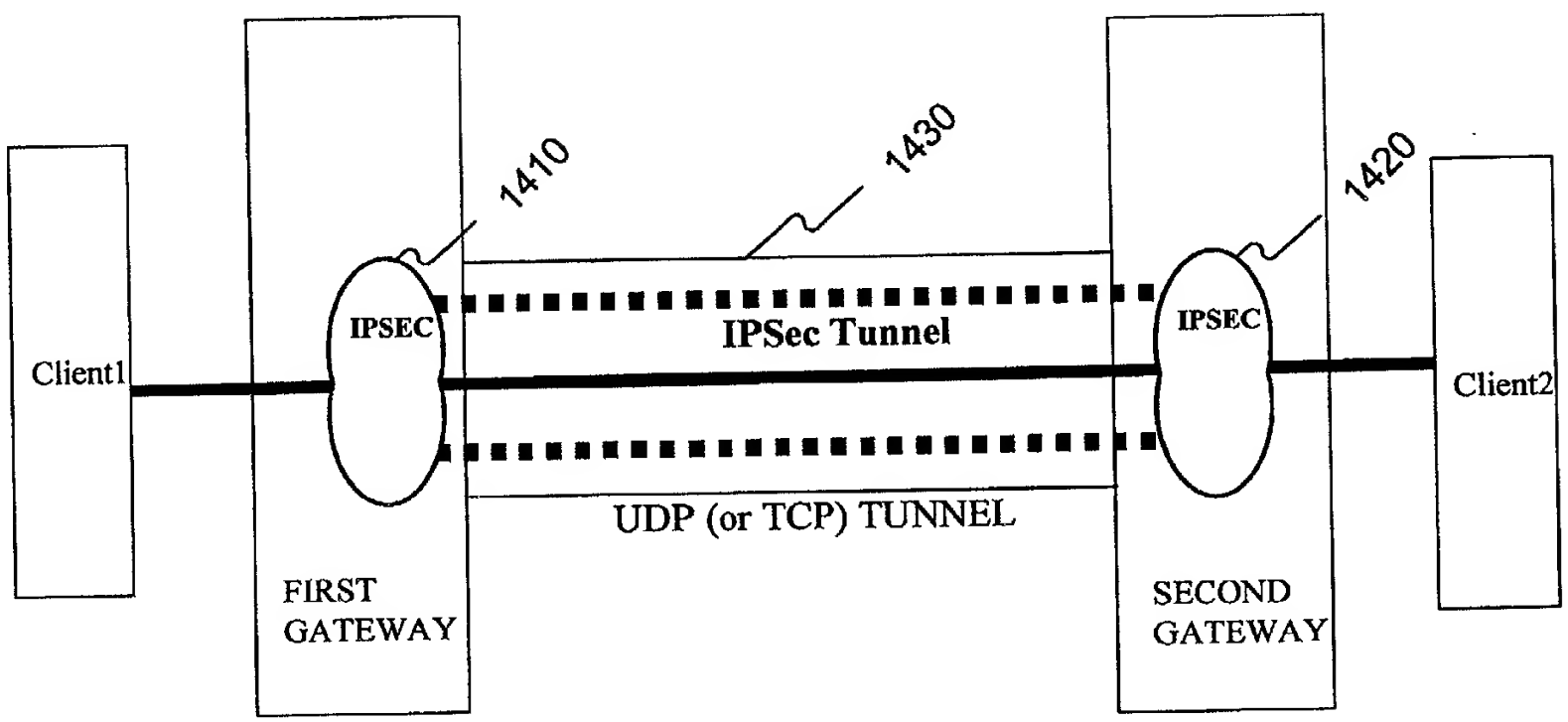
Client1
IPSEC
1410
1430
IPSec Tunnel
UDP (or TCP) TUNNEL
FIRST
GATEWAY
IPSEC
1420
SECOND
GATEWAY
Client2

FIG. 14

1500

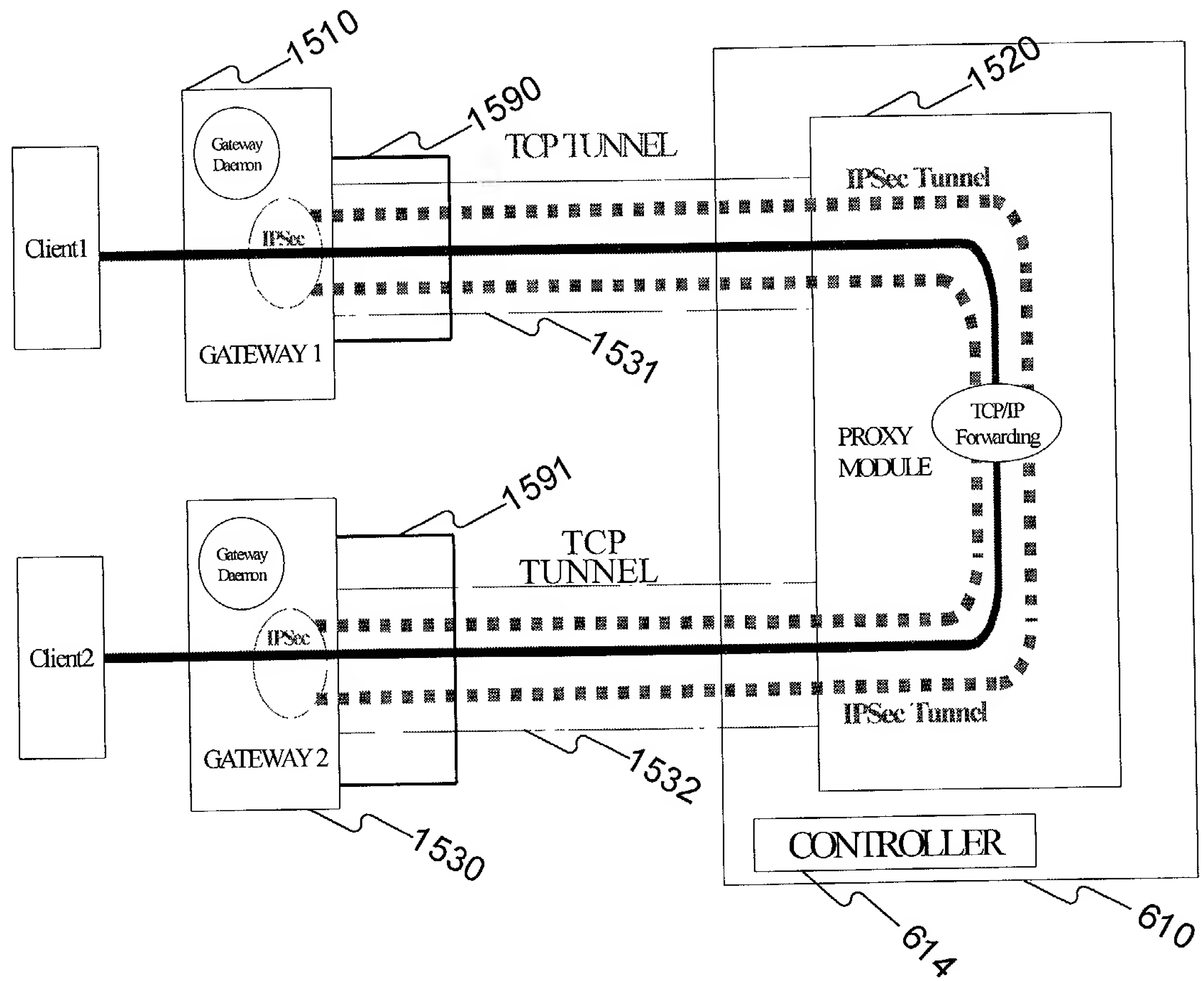
1510
1590
TCP TUNNEL
1520
IPSec Tunnel
Gateway Daemon
IPSec
Client1
GATEWAY 1
1531
PROXY MODULE
TCP/IP Forwarding
1591
TCP TUNNEL
Gateway Daemon
IPSec
Client2
GATEWAY 2
IPSec Tunnel
1532
1530
CONTROLLER
614
610

FIG. 15

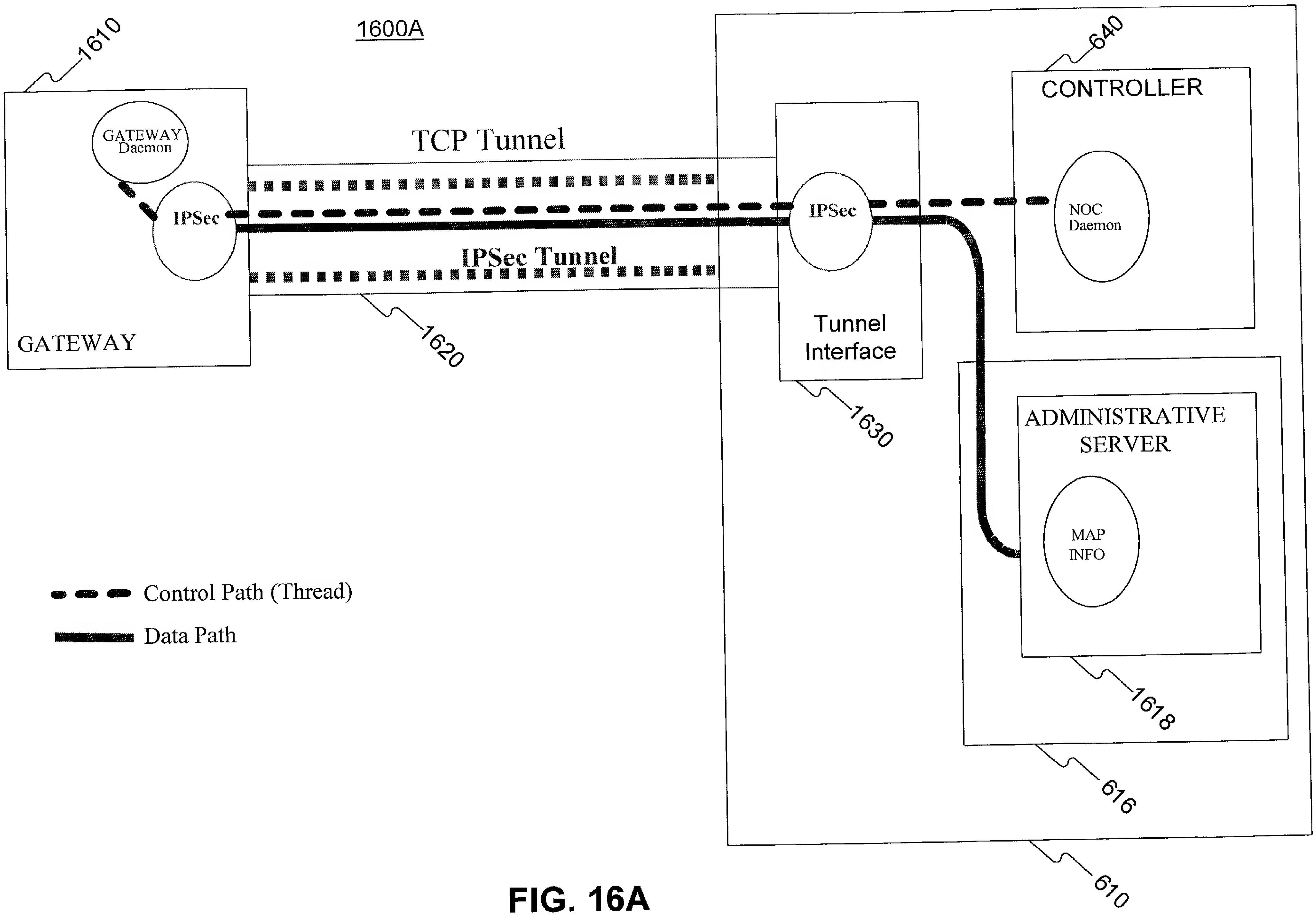

FIG. 16A

1600B

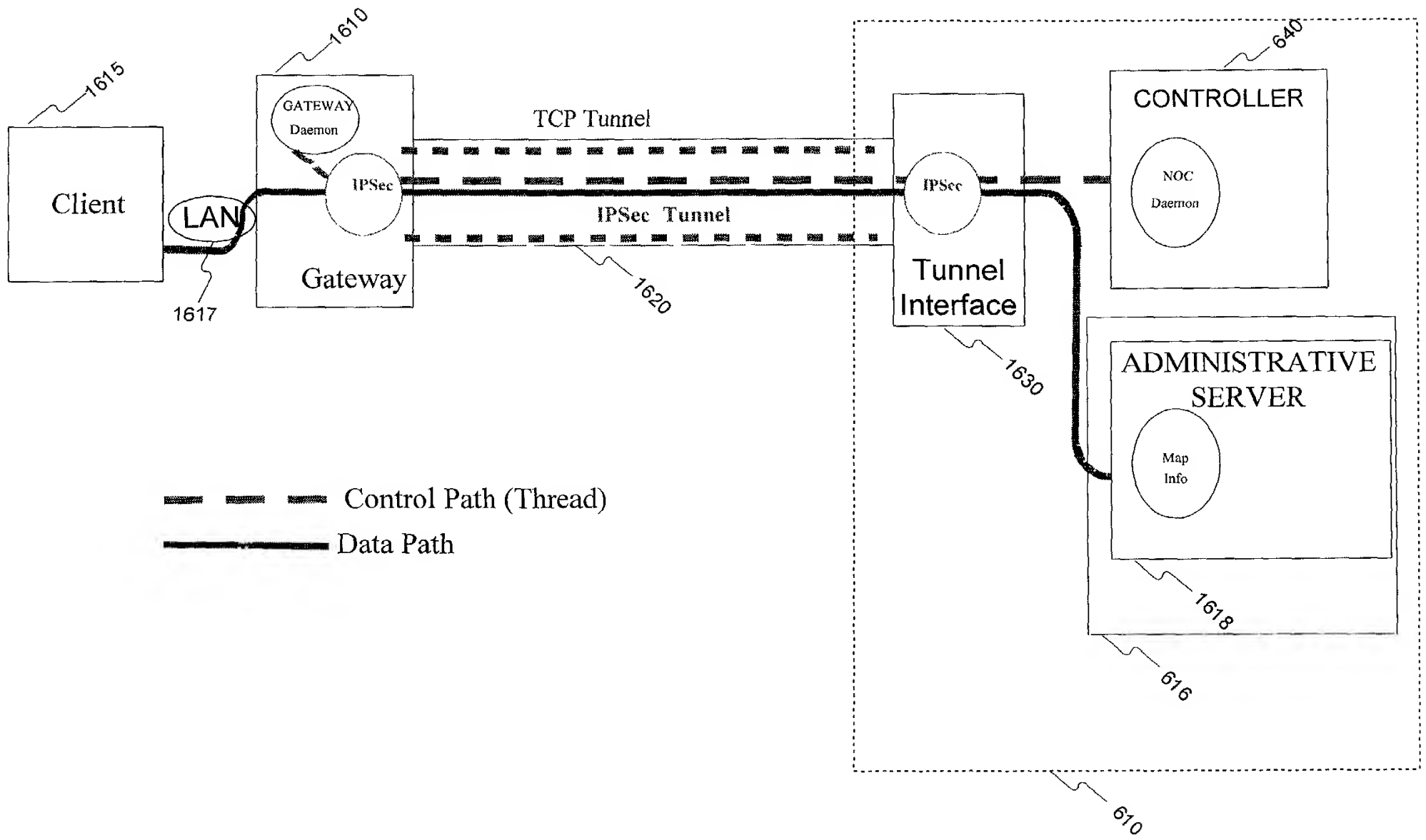

FIG. 16B

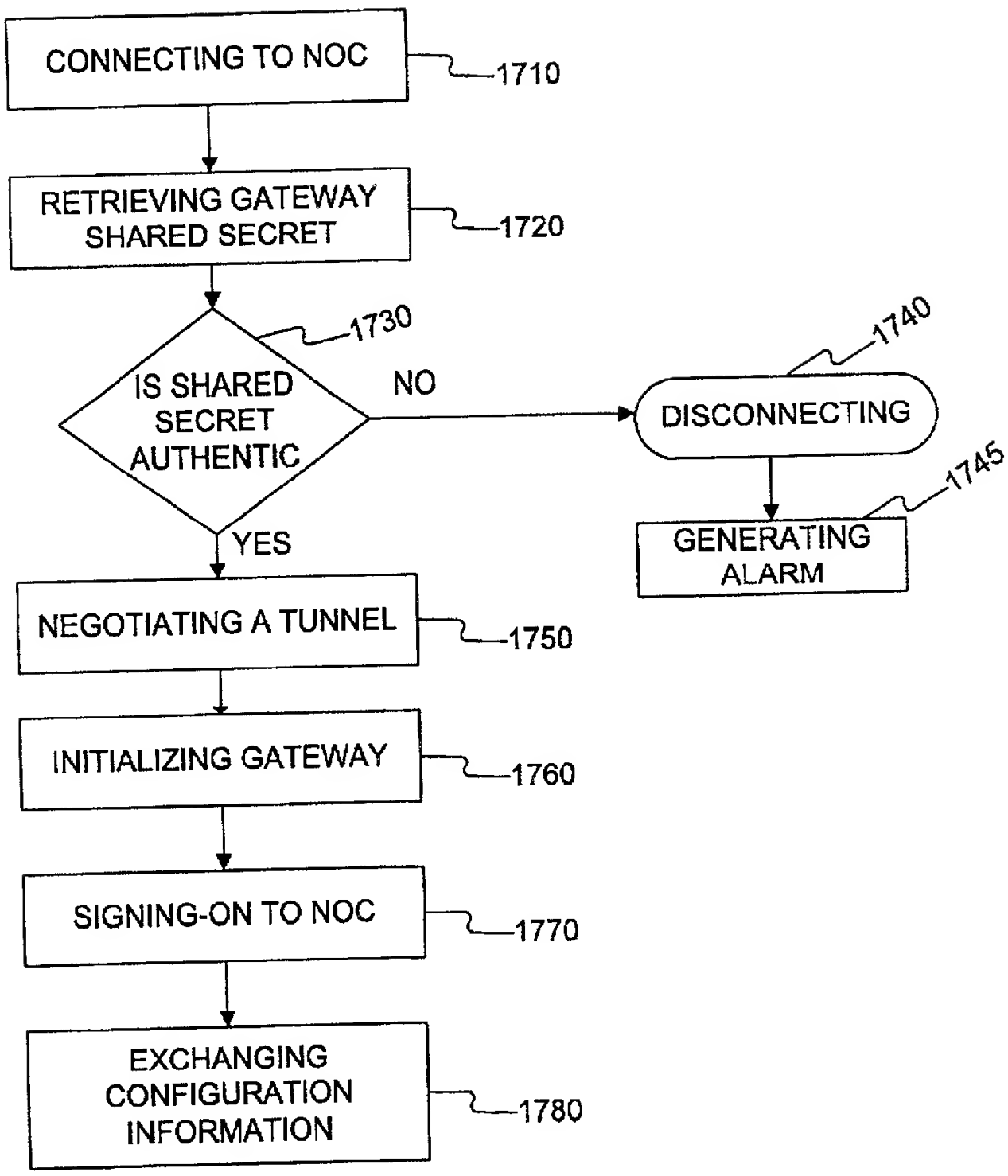
CONNECTING TO NOC
1710
RETRIEVING GATEWAY SHARED SECRET
1720
1730
IS SHARED SECRET AUTHENTIC
NO
1740
DISCONNECTING
1745
GENERATING ALARM
YES
NEGOTIATING A TUNNEL
1750
INITIALIZING GATEWAY
1760
SIGNING-ON TO NOC
1770
EXCHANGING CONFIGURATION INFORMATION
1780

FIG. 17

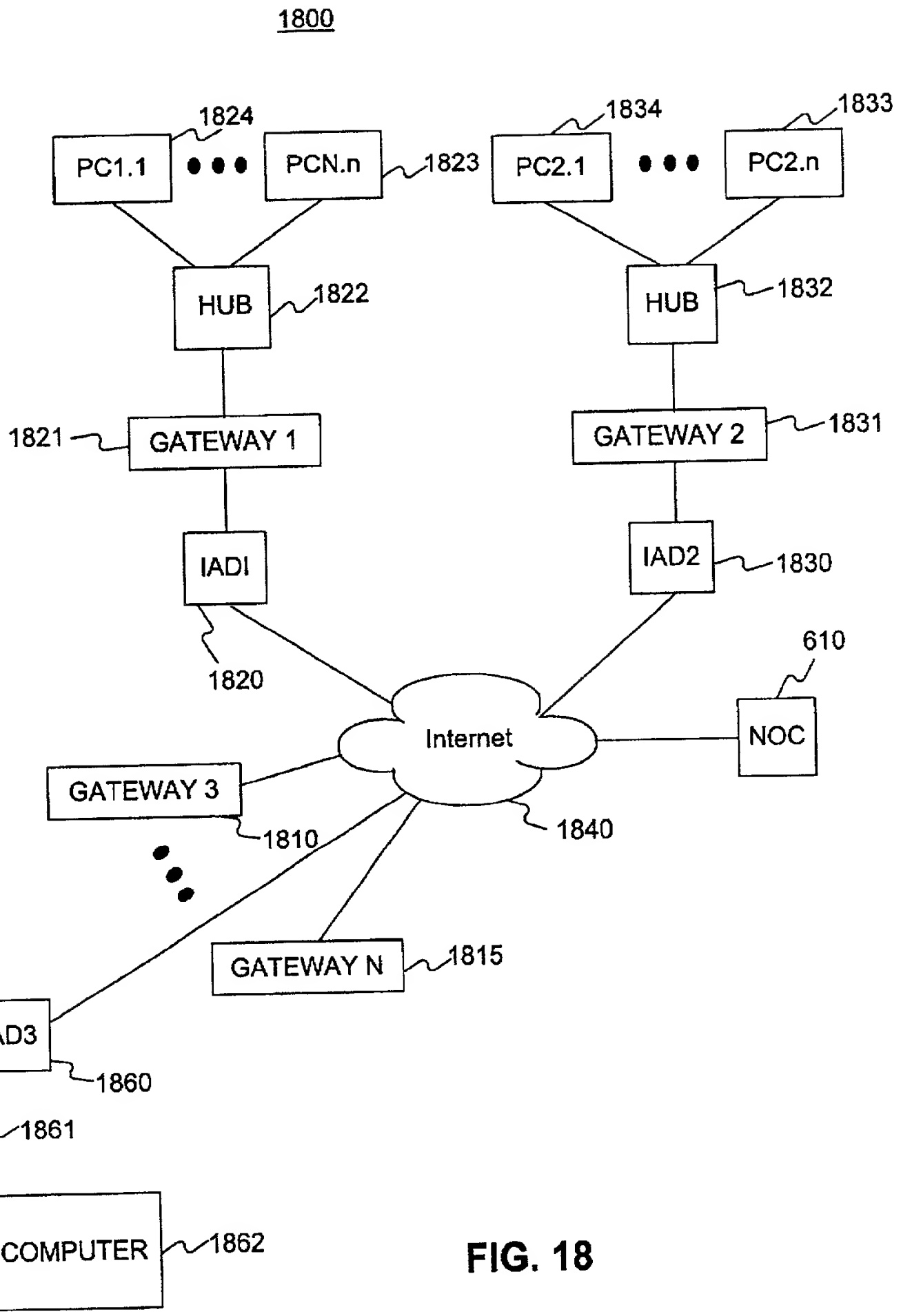
1800
1824
PC1.1
PCN.n
1823
1834
PC2.1
PC2.n
1833
HUB
1822
HUB
1832
1821
GATEWAY 1
GATEWAY 2
1831
IADI
IAD2
1830
1820
610
Internet
NOC
GATEWAY 3
1810
1840
GATEWAY N
1815
IAD3
1860
HUB
1861
COMPUTER
1862

FIG. 18

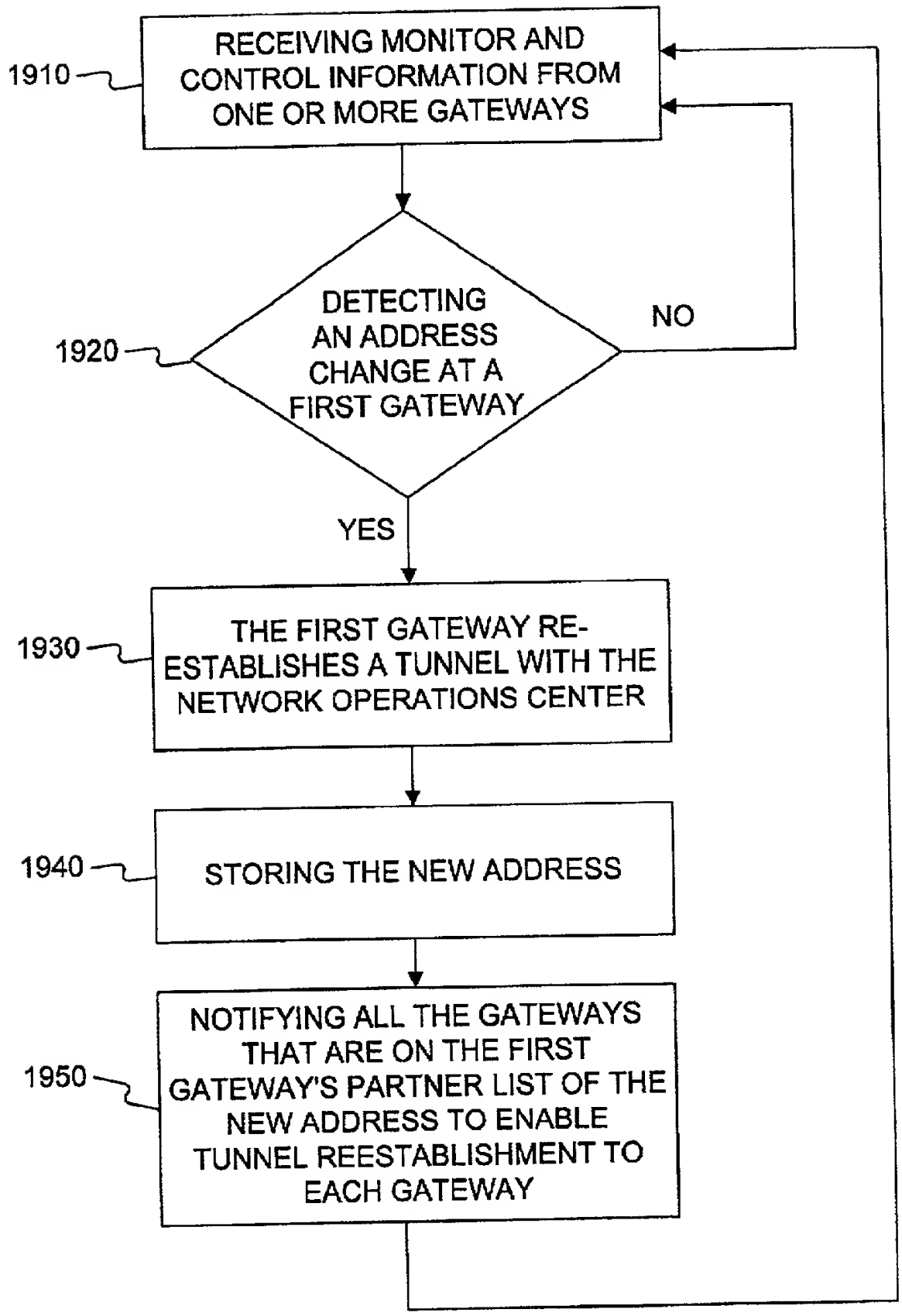
RECEIVING MONITOR AND CONTROL INFORMATION FROM ONE OR MORE GATEWAYS
1910
DETECTING AN ADDRESS CHANGE AT A FIRST GATEWAY
1920
NO
YES
THE FIRST GATEWAY RE-ESTABLISHES A TUNNEL WITH THE NETWORK OPERATIONS CENTER
1930
STORING THE NEW ADDRESS
1940
NOTIFYING ALL THE GATEWAYS THAT ARE ON THE FIRST GATEWAY'S PARTNER LIST OF THE NEW ADDRESS TO ENABLE TUNNEL REESTABLISHMENT TO EACH GATEWAY
1950

FIG. 19

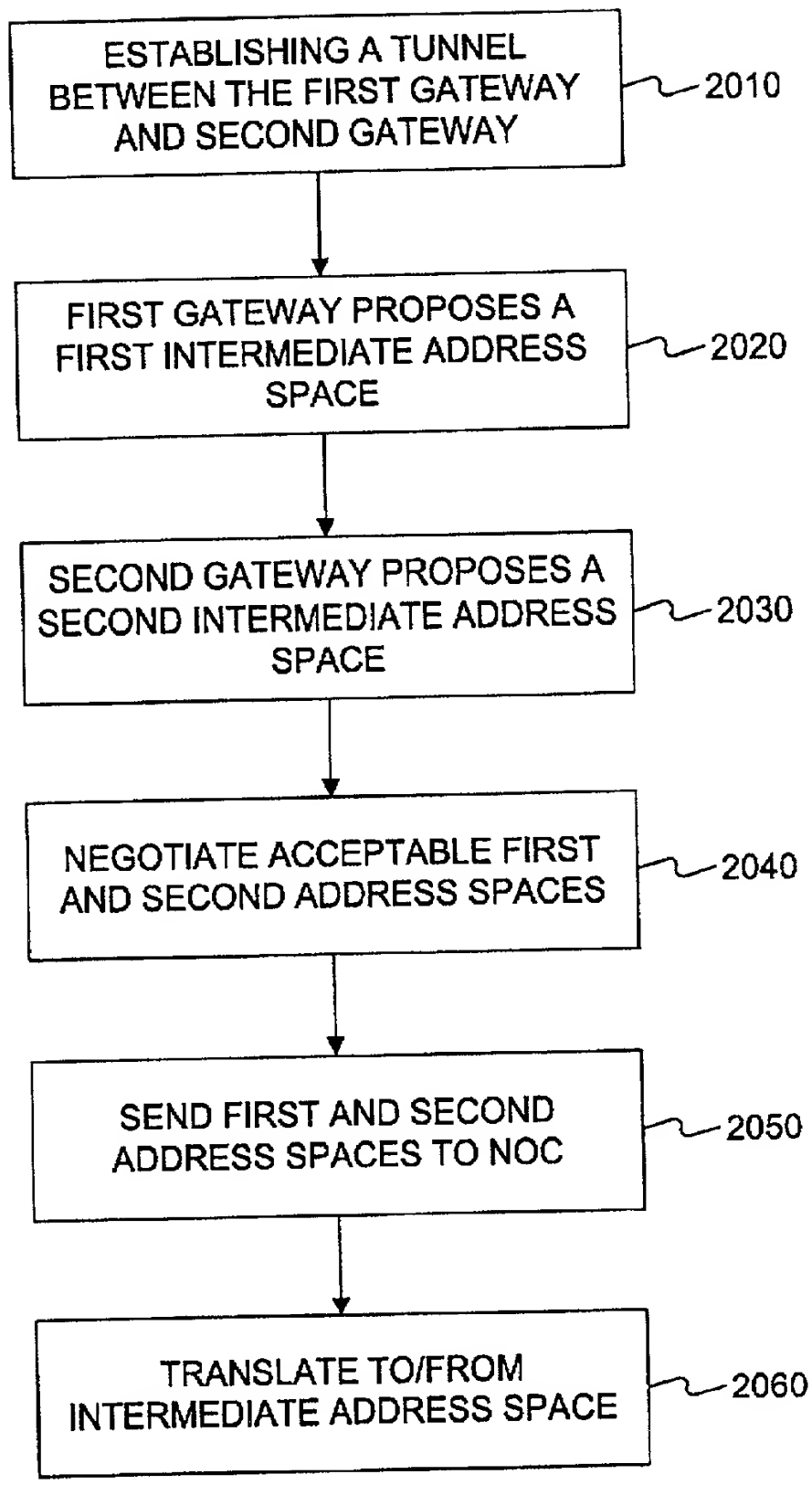
ESTABLISHING A TUNNEL BETWEEN THE FIRST GATEWAY AND SECOND GATEWAY
2010
FIRST GATEWAY PROPOSES A FIRST INTERMEDIATE ADDRESS SPACE
2020
SECOND GATEWAY PROPOSES A SECOND INTERMEDIATE ADDRESS SPACE
2030
NEGOTIATE ACCEPTABLE FIRST AND SECOND ADDRESS SPACES
2040
SEND FIRST AND SECOND ADDRESS SPACES TO NOC
2050
TRANSLATE TO/FROM INTERMEDIATE ADDRESS SPACE
2060

FIG. 20

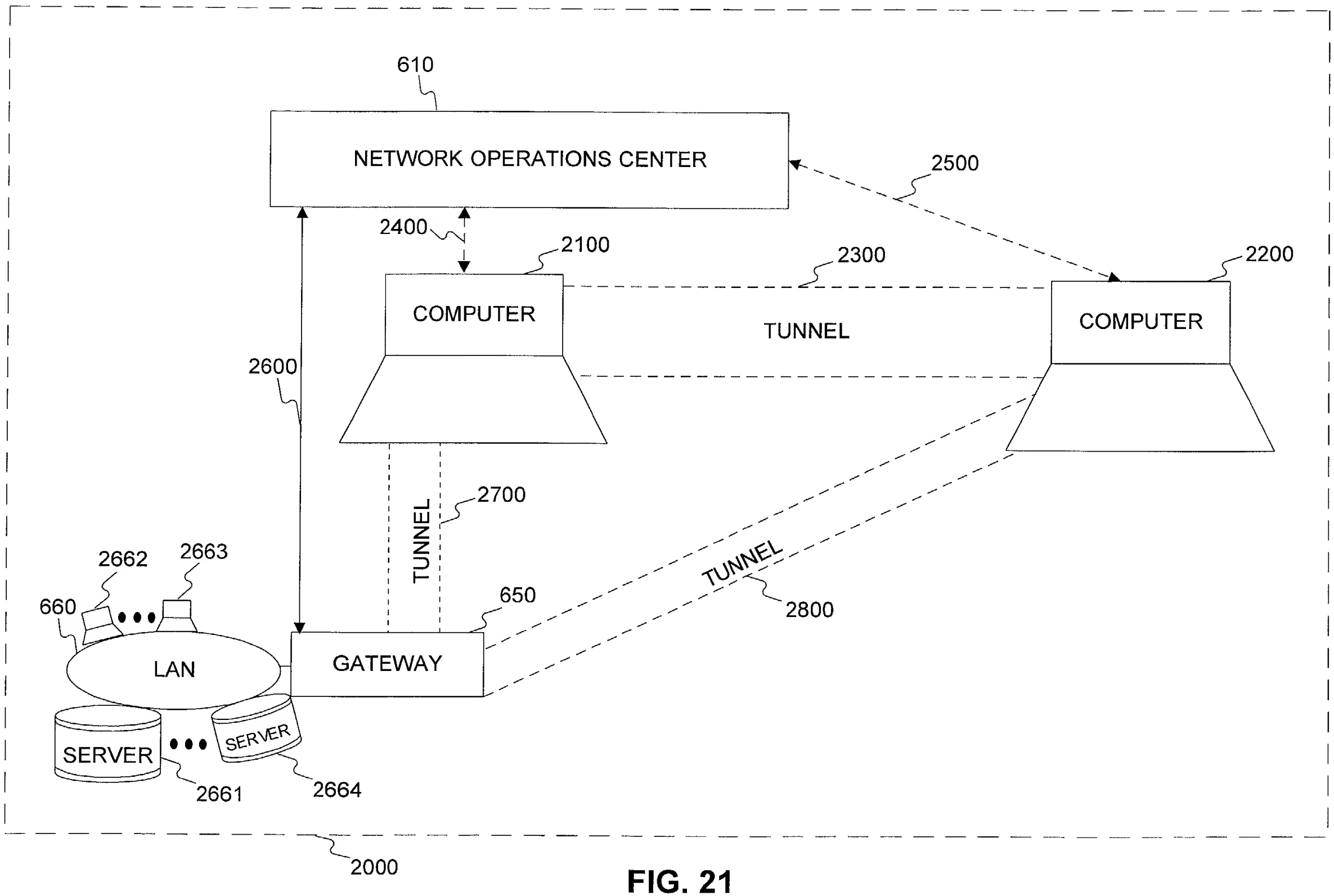
610
NETWORK OPERATIONS CENTER
2500
2400
2100
2300
2200
COMPUTER
TUNNEL
COMPUTER
2600
2700
TUNNEL
TUNNEL
2800
2662
2663
660
650
LAN
GATEWAY
SERVER
SERVER
2661
2664
2000

FIG. 21